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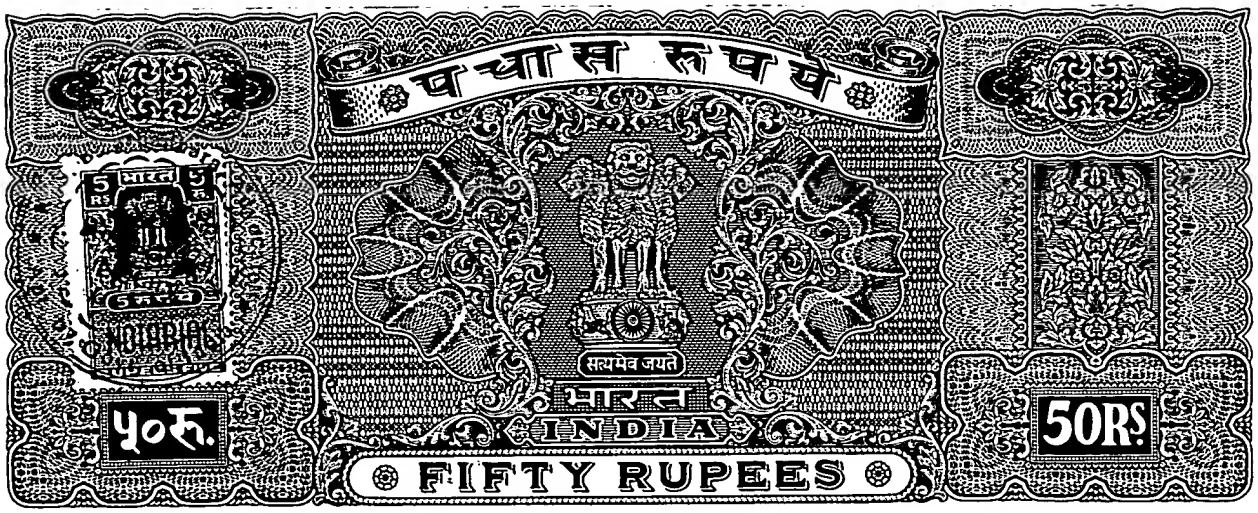

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Raman Naduhatty Selai et al.	: Art Unit: 1764
Serial No.:	09/871,077	: Examiner: Tam M. Nguyen
Filed:	May 31, 2001	:

FOR: EXTRACTION OF AROMATICS FROM HYDROCARBON OIL USING FURFURAL-CO-SOLVENT EXTRACTION PROCESS

DECLARATION UNDER 37 C.F.R. § 1.132

I, Dr. N.S.Raman, declare as follows:

(1) I received a M.Sc in Chemistry from Madras University in 1985, and a Ph.D degree in Physical Chemistry from IIT, Chennai in 1991. I am currently employed by Indian Oil Corporation Ltd., the assignee of the above captioned patent application. I am a member of Catalysis Society of India & Indian Society of Analytical Scientists.

(2) I have worked for 11 years in the field of Lube refining, Solvent Extraction, Solvent Dewaxing, Crude evaluation & Value addition to refinery streams, etc.

(3) I am the inventor or a co-inventor of Indian Patent no. 190066 filed on 22/11/1997. I am a co-author of about 28 technical publications and presentations (List of some of the publications is enclosed) and more than 40 internal reports at IOC R&D Centre (List of some of the internal reports presented is enclosed herewith).

(4) I am a co-inventor of the above-captioned United States Patent application and am familiar with its contents.

(5) I am familiar with the Office Action mailed January 21, 2003, in which the Examiner rejected claims 1-13 as unpatentable over Henry, U.S. Patent 3,929,617 ("Henry"). I am

also familiar with the Office action of August 13, 2002, in which the Examiner also rejected claim 1-13 as unpatentable over Henry.

(6) The feedstocks used by Henry are hydrocrackates. Henry, column 1, lines 55-66. Hydrocrackates have less than 10 vol% aromatics, typically at most 5 vol% aromatics. In contrast, the feedstocks used in the present invention contain at least about 25 vol% aromatics, specifically from 25 to 80 vol% aromatics, and more specifically from 40 vol% to 60 vol% aromatics.

(7) The following experiments were carried out either by me or under my direction.

(8) Following the procedure generally described in Example 1 of the specification, a feed of Inter-Neutral Distillate, whose properties are given in on page 8, Table 2, of the Specification, was extracted with furfural solvent. No co-solvent was added to the furfural. Different solvent to feed ("S/F") ratios were used. The results are shown in Table 1.

TABLE 1

S/F Ratio	Raffinate Yield (wt%)	Raffinate RI (@60°C)
3.0	54.08	1.4675
2.0	57.1	1.4685
1.8	60.7	1.4709
1.5	66.17	1.4738
1.2	72.16	1.4761
1.0	75.58	1.4775

(9) From these the data in Table 1, it is apparent that when furfural was used without a co-solvent, the quality of the raffinate decreased as the yield increased. As the S/F ratio decreased from 3.0 to 1.0, the raffinate yield increased from about 54% to about 76%. However, its quality decreased as shown by the increase of raffinate refractive index. This increase in refractive index indicates that the raffinate contained a higher proportion of aromatics. As disclosed in the specification on page 5, lines 19-22, aromatics contribute to poor stability and viscosity index for lube oil, and thus, are undesirable.

(10) Following the procedure generally described in Example 1 of the specification, a feed of Inter-Neutral Distillate, was extracted with furfural containing different amounts of dimethyl formamide (DMF) as the co-solvent. The S/F (solvent to feed) ratio was maintained constant at 1.0. The data are presented in Table 2.

Table 2

DMF (wt%)	Raffinate yield (wt%)	Raffinate RI (@60°C)
1	65	1.4732
10	68	1.4732
30	70	1.4732
50	73	1.4752
70[a]	-	-

[a] The density of the solvent is close to that of the feedstock, so counter current extraction cannot be used.

(11) From these the data in Table 2, it is apparent that when the furfural contained between 1 wt% and 30 wt% of dimethyl formamide, the yield of raffinate increased, but refractive index remained the same. Thus, the quality of the raffinate, as measured by the raffinate refractive index, was maintained.

(12) Following the procedure generally described in Example 1 of the specification, a feed of Inter-Neutral Distillate, was extracted with furfural and with furfural containing different amounts of N-methyl pyrrolidone (NMP) as the co-solvent. The S/F ratio was 1.0. The data are presented in Table 3.

Table 3

NMP (wt%)	Raffinate yield (wt%)	Raffinate RI (@60°C)
0	75.5	1.4775
5	72.5	1.4760
10	70.1	1.4751
20	66.2	1.4738
30	63.6	1.4725

(13) N-Methyl pyrrolidone is disclosed by Henry at column 6, line 13-19. However, it is not one of the co-solvents claimed in the instant application. From these the data in Table 1, it is apparent that when the raffinate yield increased from about 64% to about 76%, the

refractive index of the raffinate increased. Thus, quality of the raffinate, as measured by raffinate refractive index, decreased as the raffinate yield increased.

DECLARATION

I declare that all statements made here of my own knowledge are true and that all statements made on information and belief are believed to be true and that these statements were made with full knowledge that willful false statements so made are punishable by fine and imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 27st November 2003

By: _____
(Dr N. S. RAMAN)

K. S. Balashankare, Advocate
Regn 1474
Notary
Apt. by Govt of India

ATTESTED
NOTARY DELHI
27 NOV 2003

Publications of Dr.N.S.RAMAN, Dy.Manager(Research), Indian Oil Corporation Ltd, R&D Centre, Faridabad, India

S.No.	Publications related to Lube & Wax Processing
1	Process for demetallisation of petroleum distillates and residues for removal of organically bound metals N.S.Raman, A.Subba Rao, B.S.Rawat and A.K.Bhatnagar, Indian Patent No. 190066, 1997
2	Cosolvent for Furfural Extraction Process N.S.Raman, I.Devotta, M.Bhaskar, P.Venkatesan, B.S.Rawat and A.K.Bhatnagar, Indian patent applied, May 2001
3	Upgradation of Assam crude vacuum resid for the production of microcrystalline wax from Short path Distillates N.S.Raman, N.P.Gwasikoti, S.C.Mehta, B.S.Rawat, B.R.Tyagi, R.P.Verma, S.P.Srivastava and A.K.Bhatanagar, Hydrocarbon Technology, 1997, 87-92
4	Base oil from non-lube bearing Indian crude mix through Hydroprocessing N.S.Raman, N.P.Gwasikoti, B.S.Rawat, S.P.Srivastava and A.K.Bhatanagar, 1st Int.Sym.Fuels and Lubricants, New Delhi, 1997
5	Effect of distillate cutpoint on the oil content of Interneutral slack wax N.S.Raman, B.S.Rawat and A.K.Bhatnagar, Proc.Pet.Conf and Exhibition 3rd, 1999
6	Wax specialities: An option for value addition N.S.Raman, H.Bhatia, N.R.Radhakrishnan, E.Sayanna, R.P.Verma and A.K.Bhatnagar, 2nd Int.Sym. Fuels and Lubricants, 2002

S.No.	Internal Publications at Indian Oil R&D Centre, Faridabad (Related to Lube & wax processing)
	Upgradation of Assam crude vacuum residue for the production of microcrystalline wax from short path and potstill distillates, IOC R&D report No. 95040, 1995
2	Theoretical lube potential of RCO(P) ex-Haldia Refinery, IOC R&D report No. 95066, 1995
3	Environment friendly VHVI LOBS and food grade wax from JR Hydrocracker bottom, IOC R&D report No. 96099, 1996
4	Effect of dewaxing aid (Shell 1615) on the dewaxing of Haldia Interneutral, IOC R&D report No. 96051, 1996
5	Theoretical lube potential of low sulphur Labuan RCO ex-Haldia Refinery, IOC R&D report No. 97016, 1997

6	Reduction of oil content of IN slack wax ex-HR, IOC R&D report No. 98029, 1998
7	Solvent extraction for Lubes and CBFS, IOC R&D report No. 99091, 1999
8	Development of cosolvent for furfural extraction process, IOC R&D report No. 01002, 2001
9	Simulation studies on furfural extraction process, Industrial training report, July 2001
10	Evaluation of filter aids for dewaxing of bright neutral raffinate ex-Haldia refinery, IOC R&D report No. 03011, 2003
11	Furfural extraction studies for the production of Transformer oil feedstock (TOFS), IOC R&D report No. 03048, 2003
12	Development of cosolvent furfural extraction or "Incofex" process, IOC R&D report No. 03080, 2003

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